

On the Visibility of Stars in the Pleiades to the Naked Eye.  
By Professor Winnecke.

I had lately to look over the *Historia Cœlestis Lucii Barretti*,\* Augustæ Vindelicorum, MDCLXVI. There I found, on p. lxxxv., some observations of the *Pleiades* made 1579, December 24, by Moestlin† (afterwards preceptor of Kepler at Tübingen, then Diaconus at Baknang, in Wurtemberg), which are very interesting, forming indeed the *first* special catalogue of this important cluster. In the excerpts of the manuscripts of Moestlin, made by Shickard and printed by Curtz in his *Historia Cæl.*, we find the following statement.

"1579, December 24, *Plejades* ita reperit. Declinationem primæ 22° 32', secundæ 22° 52', tertiæ 22° 48', quartæ 22° 23', quintæ 22° 36', sextæ 22° 37', septimæ 22° 38', octavæ 22° 42', nonæ 22° 57', decimæ 23° 12', undecimæ 22° 4'. Ascensiones rectas illarum numeravit à prima, scilicet secundæ 7', tertiæ 16', quartæ 22', quintæ 39', sextæ 1° 0', sept. 59', octavæ 2', nonæ 15', decimæ 359° 58', ultimæ 42'."

There is also given a coarse woodcut representing the stars, which it is not worth while to reproduce because it contains several obvious mistakes, probably due to the circumstance, that in the woodcut only 10 stars are given, whilst 11 were observed by Moestlin. It is possible that Moestlin has *seen* so many as 14 stars with the naked eye; for Kepler, in his *Dissertatio cum Nuncio Sidereo* (*Opera Collecta*, vol. ii. p. 500) relates, "Moestlinus majusculas in Plejadibus ordinaria numerat, nisi fallor, 14."

Employing Moestlin's *measures*, we get the following map of the stars seen by him in the *Pleiades*, 1579, December 24 (see p. 148).

There is no difficulty in identifying these stars as the following in Bessel's Catalogue :—

1 = Electra	m 4.5	7 = Plejone	m 5.6
2 = Taygeta	5	8 = Celæno	5.6
3 = Maja	5	9 = { 21 k Plej.	7.8
4 = Merope	5	{ 22 l „	7.8
5 = Alcyone	3.4	10 = 18 m Plej.	7
6 = Atlas	4.5	11 = Anon Bess. { 25	8.9
		{ 26	9

Reducing Bessel's places of these stars to 1580.0 without proper motion, which, for our purpose, may be considered the same for all stars of the cluster, we get :—

\* Anagram of Alberti Curtii, the Latin name of the Jesuit, Albert Curtz, 1671.

† Michael Moestlin, born 1550, September 30, at Göppingen; died 1631, December 20, at Tübingen.

		R.A. 1580'o.	Decl. 1580'o.	M—B.	Error.
1	Electra	50 2'1	+ 22 42'6	+ 10'6	+ 0'8
2	Taygeta	50 6'2	23 4'0	12'0	+ 2'2
3	Maja	50 15'6	22 58'3	10'3	+ 0'5
4	Merope	50 24'0	22 33'4	10'4	+ 0'6
5	Alcyone	50 40'8	22 43'4	7'4	— 2'4
6	Atlas	51 5'4	22 41'1	4'1	— 5'7
7	Plejone	51 5'5	22 46'1	8'1	— 1'7
8	Celæno	50 0'6	22 53'1	11'1	+ 1'3
9	$\frac{21k + 22l}{2}$	50 17'5	23 8'8	11'8	+ 2'0
10	18m	50 4'7	23 26'3	14'3	+ 4'5
11	$\frac{\text{An. 25} + \text{An. 26}}{2}$	50 44'7	22 11'8	7'8	— 2'0

The column M—B contains the difference between the declinations of Moestlin and Bessel; the last column the outstanding error after applying a constant correction of +9'·8 to the former.

Putting the R.A. of *Electra* = 0, we get the difference in R.A.

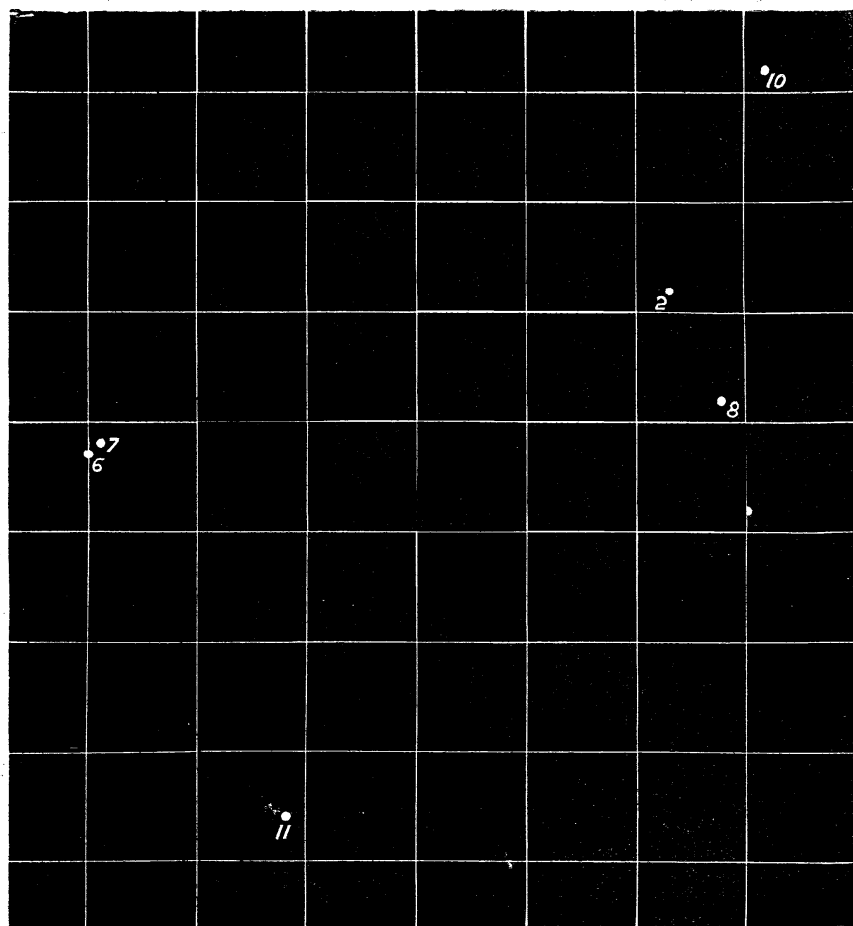
	Bessel.	Moestlin.	M—B.
(2)–(1)	+ 4'1	+ 7	+ 2'9
(3)–(1)	13'5	16	+ 2'5
(4)–(1)	21'9	22	+ 0'1
(5)–(1)	38'7	39	+ 0'3
(6)–(1)	63'3	60	— 3'3
(7)–(1)	+ 63'4	59	— 4'4
(8)–(1)	— 1'5	2	+ 3'5
(9)–(1)	+ 15'4	+ 15	— 0'4
(10)–(1)	2'6	— 2	— 4'6
(11)–(1)	+ 42'6	+ 42	— 0'6

The sum of the errors (each error as positive) is for Decl. 23'·7, for R.A. 22'·6. The probable error of a difference of R.A. or Decl. is therefore nearly the same and about ±2'.

The method used by Moestlin in getting his observations is not stated, but it is probable that the measures were taken by a Radius astronomicus just finished by his own hands. In the excerpta occurs the following statement:—"Medio Decembris (1579) fabrefecit radium observatorium, quo prius uti noluerat propter lubricitatem utendi. Sed quia vidit infixarum locis tot errores, fabrefecit. Nil enim prosunt planetarum observationes, si fixarum situs falsi sunt. Ea fuit causa, quæ deceptis canonis planetici autores etc.; has prius reformare debuissent. Regulam

sumpsit 14 pedes longam, dividens in 14 particulas, et aptavit diversa transversaria partium 10, 16, 20, 32, 40, 60, 80, 100, 160, 200, 300, 400, 600, 800, iis pinnacidia junxit ad extremitates. Regulæ ipsi prope oculum infixit cuspidem certius collinandi gratia."

The little catalogue, given above, appears to be of some importance. Moestlin made it at a time when no telescope had given evidence that there are a great many stars in the *Pleiades*. The accuracy of their relative places is truly astonishing in so difficult an object. It is most interesting to compare the chart of the *Pleiades* founded on Moestlin's measures with that given by the Astronomer Royal (*Monthly Notices*, vol. xxiii. p. 175). Ten of the stars seen by both observers are identical without a doubt, and perhaps the 11th star is also the same as that seen at Greenwich, with a large error in Moestlin's measures. The 12th star seen at Greenwich is possibly also shown in the coarse woodcut mentioned above.



Strassburg,  
1878, December 3.